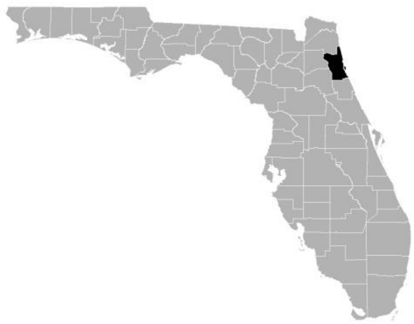
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 2 OF 7



ST. JOHNS COUNTY, FLORIDA

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
HASTINGS, TOWN OF	120282
ST. AUGUSTINE, CITY OF	125145
ST. AUGUSTINE BEACH, CITY OF	125146
ST. JOHNS COUNTY, UNINCORPORATED AREAS	125147

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5.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed on Table 24, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 13. Roughness coefficients are provided in Table 14. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

Table 13: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Atlantic Ocean	Entire coastline	Entire coastline	ADCIRC+ SWAN	JPM-OS	2015	VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Big Lige Branch	Confluence with Cunningham Creek	Approximately 450 feet upstream of Tranquil Drive	Regional Regression Equations	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Big Lige Branch	Approximately 450 feet upstream of Tranquil Drive	Approximately 1,800 feet upstream of Tranquil Drive	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Cabbage Creek	Confluence with Tolomato River	Approximately 3,290 feet upstream of Harbor View Drive	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Capo Creek	Confluence with Tolomato River	Approximately 2 miles upstream of confluence with Tolomato River	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Casa Cola Creek	Confluence with Tolomato River	Approximately 30 feet upstream of Unnamed Tributary	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Casa Cola Creek, continued	Confluence with Tolomato River	Approximately 30 feet upstream of Unnamed Tributary	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Cracker Branch	Confluence with Pellicer Creek	At Interstate 95	Regional Regression Equations	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Cracker Branch	At Interstate 95	Approximately 5.3 miles upstream of Interstate 95	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Cracker Branch Tributary 1	Confluence with Cracker Branch	At unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Cracker Branch Tributary 2	Confluence with Cracker Branch	Approximately 2,460 feet upstream of confluence with Cracker Branch	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Cunningham Creek	Confluence with St. Johns River	Approximately 1,550 feet upstream of State Road 13N	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that inter-sected the coastal surge.
Cunningham Creek	Approximately 1,550 feet upstream of State Road 13N	Approximately 2 miles upstream of Flora Branch Boulevard	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Cunningham Creek, continued	Approximately 1,550 feet upstream of State Road 13N	Approximately 2 miles upstream of Flora Branch Boulevard	HEC-1	HEC-RAS	2003	AE w/ Floodway	The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events
Dave Branch	County boundary	Approximately 5,000 feet upstream of county boundary	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Dave Branch	County boundary	Approximately 5,000 feet upstream of county boundary	ICPR	ICPR	2015	AE	The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Dave Branch Tributary 1	Confluence with Dave Branch	Approximately 1,500 feet upstream of confluence with Dave Branch	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Dave Branch Tributary 2	Confluence with Dave Branch	Approximately 1,535 feet upstream of confluence with Dave Branch	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Dave Branch Tributary 2, continued	Confluence with Dave Branch	Approximately 1,535 feet upstream of confluence with Dave Branch	ICPR	ICPR	2015	AE	The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Deep Creek	Confluence with St. Johns River	Approximately 3,380 feet upstream of State Road 207	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Deep Creek	Approximately 3,380 feet upstream of State Road 207	Approximately 1,940 feet upstream of confluence of Sixteenmile Creek	Regional Regression Equations	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976). Starting water-surface elevations for the HEC-2 calculations were at high tide.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Deep Creek	Approximately 1,940 feet upstream of confluence of Sixteenmile Creek	Approximately 4.6 miles upstream of confluence of Sixteenmile Creek	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Durbin Creek	County boundary	Approximately 1.2 miles upstream of the county boundary	*	*	2015	AE	Combined probability analysis was calculated for each riverine node that intersected the coastal surge.
Durbin Creek	Approximately 1.2 miles upstream of the county boundary	Approximately 100 feet upstream of U.S. Route 1	USACE HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Durbin Creek, continued	Approximately 1.2 miles upstream of the county boundary	Approximately 100 feet upstream of U.S. Route 1	USACE HEC-1	HEC-RAS	2003	AE w/ Floodway	Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The slope-area method was used based on stream invert elevations near the beginning of the stream study reach to establish starting water-surface elevations.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Durbin Creek	Approximately 100 feet upstream of U.S. Route 1	Approximately 780 feet upstream of US Route 1	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Durbin Creek Tributary	Confluence with Durbin Creek	At Race Track Road	Regional Regression Equations	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Durbin Creek Tributary No. 1	Confluence with Durbin Creek	Approximately 1.4 miles upstream of confluence with Durbin Creek	*	*	*	AE	*
East Creek	Confluence with Matanzas River	Approximately 3,670 feet upstream of Tides End Drive	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
East Creek, continued	Confluence with Matanzas River	Approximately 3,670 feet upstream of Tides End Drive	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
East Creek Main	Confluence with East Creek North	Approximately 2,000 feet upstream of the confluence with East Creek North	Regional Regression Equations	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
East Creek North	At Del Webb Parkway	Approximately 1.2 miles upstream of Del Webb Parkway	Regional Regression Equations	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
East Creek North, continued	At Del Webb Parkway	Approximately 1.2 miles upstream of Del Webb Parkway	Regional Regression Equations	HEC-2	*	AE	Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
East Creek North	At Del Webb Parkway	Approximately 470 feet downstream of Del Webb Parkway	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
East Creek North	Approximately 1.2 miles upstream of Del Webb Parkway	Approximately 1.3 miles upstream of Del Webb Parkway	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Fish Drain	Confluence with Stevens Branch	Approximately 6.6 miles upstream of confluence with Stevens Branch	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Fish Drain, continued	Confluence with Stevens Branch	Approximately 6.6 miles upstream of confluence with Stevens Branch	ICPR	ICPR	2015	AE	Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Flora Branch	Confluence with Durbin Creek	At Race Track Road	*	*	2015	AE	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Flora Branch	At Race Track Road	Approximately 3,230 feet upstream of Flora Branch Boulevard	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Flora Branch, continued	At Race Track Road	Approximately 3,230 feet upstream of Flora Branch Boulevard	HEC-1	HEC-RAS	2003	AE w/ Floodway	The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The slope-area method was used based on stream invert elevations near the beginning of the stream study reach to establish starting water-surface elevations.
Guana River	Confluence with Tolomato River	Approximately 10 miles upstream of Guana River Road	ADCIRC+ SWAN	JPM-OS	2015	AE, AH	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Guana River, continued	Confluence with Tolomato River	Approximately 10 miles upstream of Guana River Road	ADCIRC+ SWAN	JPM-OS	2015	AE, AH	These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Indian Creek	Confluence with Tolomato River	Approximately 3,250 feet upstream of confluence with Tolomato River	ADCIRC+ SWAN	JPM-OS	2015	VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
ISOWET-01	20 Mile Road	Wilson Lane	*	*	*	AE	*
ISOWET-02	20 Mile Road	Wilson Lane	*	*	*	AE	*

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Julington Creek	Confluence with St. Johns River	Confluence of Durbin Creek	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Kendall Creek	Confluence with St. Johns River	At State Route 13	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Kendall Creek	At State Route 13	Approximately 1,780 feet upstream of Longleaf Pine Parkway	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Kendall Creek, continued	At State Route 13	Approximately 1,780 feet upstream of Longleaf Pine Parkway	HEC-1	HEC-RAS	2003	AE w/ Floodway	Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting- water-surface elevations, channel cross sections, and roughness factors (Manning's "n").

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Kendall Creek, continued	At State Route 13	Approximately 1,780 feet upstream of Longleaf Pine Parkway	HEC-1	HEC-RAS	2003	AE w/ Floodway	The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.
Kendall Creek	Approximately 1,780 feet upstream of Longleaf Pine Parkway	Approximately 1.6 miles upstream of Longleaf Pine Parkway	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Kentucky Branch	Confluence with St. Johns River	Approximately 2,245 feet upstream of State Road 13	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Kentucky Branch	Approximately 2,245 feet upstream of State Road 13	Approximately 4,300 feet upstream of confluence of Kentucky Branch Tributary	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Kentucky Branch, continued	Approximately 2,245 feet upstream of State Road 13	Approximately 4,300 feet upstream of confluence of Kentucky Branch Tributary	HEC-1	HEC-RAS	2003	AE w/ Floodway	Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Kentucky Branch	Approximately 4,300 feet upstream of confluence of Kentucky Branch Tributary	Approximately 4,800 feet upstream of confluence of Kentucky Branch Tributary	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Kentucky Branch Tributary	Confluence with Kentucky Branch	Approximately 118 feet upstream of Greenbriar Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Kentucky Branch Tributary, continued	Confluence with Kentucky Branch	Approximately 118 feet upstream of Greenbriar Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). Starting water-surface elevations were applied with flooding governed by larger downstream water bodies where disparity in drainage basin areas between tributary and receiving water body preclude the use of the coincident peak method.
Kentucky Branch Tributary	Approximately 118 feet upstream of Greenbriar Road	Approximately 344 feet upstream of Greenbriar Road	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Lake Vedra	At Pointe Verde Boulevard	Approximately 4,060 feet upstream of Seawalk Drive	ADCIRC+ SWAN	JPM-OS	2015	AH	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Marshall Creek	Confluence with Tolomato River	Approximately 1.3 miles upstream of confluence with Tolomato River	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Marshall Creek, continued	Confluence with Tolomato River	Approximately 1.3 miles upstream of confluence with Tolomato River	ADCIRC+ SWAN	JPM-OS	2015	AE	The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Matanzas Inlet	Confluence with Atlantic Ocean	Confluence of Matanzas River	ADCIRC+ SWAN	JPM-OS	2015	VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Matanzas River	Confluence with Tolomato River and Salt Run	County boundary	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Matanzas River, continued	Confluence with Tolomato River and Salt Run	County boundary	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
McCullough Creek	Confluence with St. Johns River	Approximately 1.8 miles upstream of County Road 13	*	*	2015	AE	*
McCullough Creek	At County Road 13	Approximately 1.4 miles upstream of County Road 13	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Mill Creek No. 1	Mouth at St. Johns River	Approximately 2,700 feet upstream of mouth at St. Johns River	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Mill Creek No. 1	Approximately 2,700 feet upstream of mouth at St. Johns River	At Greenbriar Road	Regional Regression Equations	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Mill Creek No. 1, continued	Approximately 2,700 feet upstream of mouth at St. Johns River	At Greenbriar Road	Regional Regression Equations	HEC-2	*	AE w/ Floodway	The flood routines for Mill Creek No. 1 indicated that backwater would collect in large storage areas behind crossings or structures along the stream course with restricted outlets. Hence, reservoir techniques were used to calculate the outflow downstream of these sites as indicated in Table 10, Summary of Discharges. An inflow hydrograph for the area upstream of the site was generated for each return period using the SCS standard unit hydrograph method (U.S. Department of Agriculture, 1971); the precipitation values were obtained from the "Rainfall Frequency Atlas of the United States" (U.S. Department of Commerce, 1963). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976). Starting water-surface elevations for the HEC-2 calculations were at high tide.
Mill Creek No. 2	Confluence with Sixmile Creek	Approximately 4,400 feet upstream of State Route 16	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Mill Creek No. 2, continued	Confluence with Sixmile Creek	Approximately 4,400 feet upstream of State Route 16	HEC-1	HEC-RAS	2003	AE w/ Floodway	Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n").

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Mill Creek No. 2, continued	Confluence with Sixmile Creek	Approximately 4,400 feet upstream of State Route 16	HEC-1	HEC-RAS	2003	AE w/ Floodway	Starting water-surface elevations were applied with flooding governed by larger downstream water bodies where disparity in drainage basin areas between tributary and receiving water body preclude the use of the coincident peak method.
Mill Creek No. 2	Approximately 4,400 feet upstream of State Route 16	Approximately 1 mile upstream of State Route 16	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Moses Creek	At mouth	Approximately 530 feet upstream of confluence of Moses Creek Tributary No. 3	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Moses Creek	Approximately 530 feet upstream of confluence of Moses Creek Tributary No. 3	Approximately 90 feet upstream of State Route 206	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moses Creek	Approximately 90 feet upstream of State Route 206	Approximately 590 feet upstream of State Route 206	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Moses Creek Tributary No. 1	Confluence with Moses Creek	Approximately 30 feet upstream of State Route 206	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Moses Creek Tributary No. 2	Confluence with Moses Creek	Approximately 2,500 feet upstream of Shores Boulevard	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moses Creek Tributary No. 2, continued	Confluence with Moses Creek	Approximately 2,500 feet upstream of Shores Boulevard	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Moses Creek Tributary No. 3	Confluence with Moses Creek	Approximately 2,400 feet upstream of confluence with Moses Creek	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Moses Creek Tributary No. 3	Approximately 2,400 feet upstream of confluence with Moses Creek	Approximately 2,720 feet upstream of confluence with Moses Creek	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Moses Creek Tributary No. 4	Confluence with Moses Creek	Approximately 3,500 feet upstream of confluence with Moses Creek	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moses Creek Tributary No. 4, continued	Confluence with Moses Creek	Approximately 3,500 feet upstream of confluence with Moses Creek	Regional Regression Equation	HEC-2	*	AE w/ Floodway	The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Moses Creek Tributary No. 4	Approximately 3,500 feet upstream of confluence with Moses Creek	Approximately 4,800 feet upstream of confluence with Moses Creek	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Moses Creek Tributary No. 5	Confluence with Moses Creek	Approximately 4,050 feet upstream of confluence with Moses Creek	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moses Creek Tributary No. 5	Approximately 4,050 feet upstream of confluence with Moses Creek	Approximately 1 mile upstream of confluence with Moses Creek	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Moses Creek Tributary No. 6	Confluence with Moses Creek	Approximately 3,650 feet upstream of confluence with Moses Creek	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Moses Creek Tributary No. 6	Approximately 3,650 feet upstream of confluence with Moses Creek	Approximately 1.2 miles upstream of confluence with Moses Creek	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Moultrie Creek	Confluence with Matanzas River	Approximately 75 feet upstream of Osceola Trail	*	*	2015	VE, AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moultrie Creek	Approximately 75 feet upstream of Osceola Trail	At County Highway 214	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moultrie Creek, continued	Approximately 75 feet upstream of Osceola Trail	At County Highway 214	HEC-1	HEC-RAS	2003	AE w/ Floodway	Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The slope-area method was used based on stream invert elevations near the beginning of the stream study reach to establish starting water-surface elevations.
Moultrie Creek Tributary No. 1	Confluence with Moultrie Creek	Approximately 50 feet upstream of Lewis Point Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moultrie Creek Tributary No. 1, continued	Confluence with Moultrie Creek	Approximately 50 feet upstream of Lewis Point Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The slope-area method was used based on stream invert elevations near the beginning of the stream study reach to establish starting water-surface elevations.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moultrie Creek Tributary No. 1	Approximately 50 feet upstream of Lewis Point Road	Approximately 275 feet upstream of Lewis Point Road	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Moultrie Creek Tributary No. 3	Confluence with Moultrie Creek	Approximately 200 feet upstream of Willow Walk Place	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moultrie Creek Tributary No. 3, continued	Confluence with Moultrie Creek	Approximately 200 feet upstream of Willow Walk Place	HEC-1	HEC-RAS	2003	AE w/ Floodway	The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The slope-area method was used based on stream invert elevations near the beginning of the stream study reach to establish starting water-surface elevations.
Moultrie Creek Tributary No. 3	Approximately 200 feet upstream of Willow Walk Place	Approximately 485 feet upstream of Willow Walk Place	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moultrie Creek Tributary No. 4	Confluence with Moultrie Creek	Approximately 100 feet upstream of State Route 207	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Moultrie Creek Tributary No. 4, continued	Confluence with Moultrie Creek	Approximately 100 feet upstream of State Route 207	HEC-1	HEC-RAS	2003	AE w/ Floodway	Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The slope-area method was used based on stream invert elevations near the beginning of the stream study reach to establish starting water-surface elevations.
Moultrie Creek Tributary No. 4	Approximately 100 feet upstream of State Route 207	Approximately 320 feet upstream of State Route 207	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Northeast 3 East	Confluence with Northeast Mid	Approximately 4,830 feet upstream of confluence with Northeast Mid	Regional Regression Equation	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Northeast 3 East, continued	Confluence with Northeast Mid	Approximately 4,830 feet upstream of confluence with Northeast Mid	Regional Regression Equation	HEC-2	*	AE	Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Northeast Mid	Confluence of Northeast 3 East	Approximately 4,940 feet upstream of confluence of Northeast 3 East	Regional Regression Equation	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Northwest 1 Lower	Confluence with Northwest North	Approximately 2,520 feet upstream of confluence with Northwest North	Regional Regression Equation	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Northwest North	Confluence of Northwest 1 Lower	Approximately 3,920 feet upstream of confluence of Northwest 1 Lower	Regional Regression Equation	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Orange Grove Branch	Confluence with St. Johns River	Approximately 60 feet upstream of State Route 13	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Orange Grove Branch	Approximately 60 feet upstream of State Route 13	Approximately 1.1 miles upstream of Orange Branch Trail	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Orange Grove Branch, continued	Approximately 60 feet upstream of State Route 13	Approximately 1.1 miles upstream of Orange Branch Trail	HEC-1	HEC-RAS	2003	AE w/ Floodway	Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Orange Grove Branch	Approximately 1.1 miles upstream of Orange Branch Trail	Approximately 1.4 miles upstream of Orange Branch Trail	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Oyster Creek	At US Highway 1/ Ponce de Leon Boulevard	At Railroad	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Pablo Creek	Confluence with Tolomato River	County boundary	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Pablo Creek, continued	Confluence with Tolomato River	County boundary	ADCIRC+ SWAN	JPM-OS	2015	AE	These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Pancho Creek	Confluence with Tolomato River	Approximately 1.2 miles upstream of confluence with Tolomato River	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Pellicer Creek	Confluence with Unnamed Tributary	Approximately 1 mile upstream of confluence of Cracker Branch	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Pellicer Creek	Approximately 1 mile upstream of confluence of Cracker Branch	At County Road 204	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Petty Branch	Confluence with St. Johns River	Approximately 1,340 feet upstream of confluence with St. Johns River	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Petty Branch	Approximately 1,340 feet upstream of confluence with St. Johns River	Approximately 2.1 miles upstream of State Route 13	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Petty Branch, continued	Approximately 1,340 feet upstream of confluence with St. Johns River	Approximately 2.1 miles upstream of State Route 13	HEC-1	HEC-RAS	2003	AE w/ Floodway	Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.
Petty Branch	Approximately 2.1 miles upstream of State Route 13	Approximately 3.1 miles upstream of State Route 13	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Pond L4	Town Plaza Avenue	Town Plaza Avenue	*	*	*	AE	*
Pond M1	Crosswater Parkway	Town Plaza Avenue	*	*	*	AE	*
Pond SWMF 1901	Breezy Bay Drive	Del Webb Parkway	*	*	*	AE	*

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Pond SWMF 2001	Strolling Trail	Del Webb Parkway	*	*	*	AE	*
Pond SWMF 2701	Leaflet Lane	River Run Boulevard	*	*	*	AE	*
Quarry Creek	Confluence with Matanzas River	Approximately 4,526 feet upstream of confluence with Matanzas River	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Red House Branch	Confluence with San Sebastian River	Approximately 2,945 feet upstream of County Highway 16A/Lewis Speedway	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Red House Branch	Approximately 2,945 feet upstream of County Highway 16A/Lewis Speedway	Approximately 77 feet upstream of Woodlawn Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Red House Branch, continued	Approximately 2,945 feet upstream of County Highway 16A/Lewis Speedway	Approximately 77 feet upstream of Woodlawn Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Red House Branch, continued	Approximately 2,945 feet upstream of County Highway 16A/Lewis Speedway	Approximately 77 feet upstream of Woodlawn Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The slope-area method was used based on stream invert elevations near the beginning of the stream study reach to establish starting water-surface elevations.
Red House Branch	Approximately 77 feet upstream of Woodlawn Road	Approximately 990 feet upstream of Roaring Brook Drive	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Robinson Creek	Confluence with Tolomato River	Approximately 1.5 miles upstream of confluence with Tolomato River	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Robinson Creek, continued	Confluence with Tolomato River	Approximately 1.5 miles upstream of confluence with Tolomato River	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Salt Creek Ditch	At county boundary	Approximately 6.6 miles upstream of County Road 13	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Salt Creek Ditch Tributary 1	Confluence with Salt Creek Ditch	Approximately 1.1 miles upstream of confluence with Salt Creek Ditch	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Salt Creek Ditch Tributary 1, continued	Confluence with Salt Creek Ditch	Approximately 1.1 miles upstream of confluence with Salt Creek Ditch	ICPR	ICPR	2015	AE	The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Salt Run	Confluence with Matanzas River	Approximately 2.8 miles upstream of confluence with Matanzas River	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Sampson Creek	Confluence with Durbin Creek	Approximately 4,070 feet upstream of confluence with Durbin Creek	Regional Regression Equation	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Sampson Creek, continued	Confluence with Durbin Creek	Approximately 4,070 feet upstream of confluence with Durbin Creek	Regional Regression Equation	HEC-2	*	AE	Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
San Julian Creek	Confluence with Matanzas River	Approximately 2.3 miles upstream of confluence with Matanzas River	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
San Sebastian River	Confluence with Matanzas River	Approximately 1,200 feet upstream of confluence of Red House Branch	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
San Sebastian River, continued	Confluence with Matanzas River	Approximately 1,200 feet upstream of confluence of Red House Branch	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Schoolhouse Branch	At County Road 204	Approximately 2.2 miles upstream of County Road 204	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Sixmile Creek	Confluence with St. Johns River	Approximately 2,245 feet upstream of confluence of Mill Creek No. 2	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Sixmile Creek	Approximately 2,245 feet upstream of confluence of Mill Creek No. 2	Approximately 2,900 feet upstream of Pacetti Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Sixmile Creek, continued	Approximately 2,245 feet upstream of confluence of Mill Creek No. 2	Approximately 2,900 feet upstream of Pacetti Road	HEC-1	HEC-RAS	2003	AE w/ Floodway	Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.
Sixteenmile Creek	Confluence with Deep Creek	County boundary	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
SMF-TM-02	20 Mile Road	Wilson Lane	*	*	*	AE	*
SMF-TM-03	20 Mile Road	Wilson Lane	*	*	*	AE	*

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
SMF-TM-04	20 Mile Road	Wilson Lane	*	*	*	AE	*
SMF-TM-05	20 Mile Road	Wilson Lane	*	*	*	AE	*
SMF-TM-37	20 Mile Road	Wilson Lane	*	*	*	AE	*
SMF-TM-38	20 Mile Road	Wilson Lane	*	*	*	AE	*
SMF-TM-39	20 Mile Road	Wilson Lane	*	*	*	AE	*
Smith Creek	Confluence with Tolomato River	Approximately 1.3 miles upstream of confluence with Tolomato River	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
St. Johns River	County boundary	County boundary	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River, continued	County boundary	County boundary	ADCIRC+ SWAN	JPM-OS	2015	AE	These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
St. Johns River Tributary 1 (Hickory Slough)	Confluence with St. Johns River	Approximately 50 feet downstream of Grove Bluff Road	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
St. Johns River Tributary 1 (Hickory Slough)	Approximately 50 feet downstream of Grove Bluff Road	Approximately 164 feet upstream of State Road 13N	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary 1 (Hickory Slough), continued	Approximately 50 feet downstream of Grove Bluff Road	Approximately 164 feet upstream of State Road 13N	HEC-1	HEC-RAS	2003	AE w/ Floodway	Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary 1 (Hickory Slough)	Approximately 164 feet upstream of State Road 13N	Approximately 454 miles upstream of State Road 13N	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
St. Johns River Tributary No. 2	Confluence with St. Johns River	Approximately 50 feet upstream of State Road 13N	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
St. Johns River Tributary No. 2	Approximately 50 feet upstream of State Road 13N	Approximately 50 feet upstream of Remington Forest Drive	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 2, continued	Approximately 50 feet upstream of State Road 13N	Approximately 50 feet upstream of Remington Forest Drive	HEC-1	HEC-RAS	2003	AE w/ Floodway	Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 2	Approximately 50 feet upstream of Remington Forest Drive	Approximately 640 feet upstream of Remington Forest Drive	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
St. Johns River Tributary No. 3, Branch No. 1	Confluence with St. Johns River	Approximately 1,970 feet upstream of confluence with St. Johns River	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
St. Johns River Tributary No. 3, Branch No. 1	Approximately 1,970 feet upstream of confluence with St. Johns River	Approximately 2,120 feet upstream of confluence of St. Johns River Tributary No. 3, Branch No. 2	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 3, Branch No. 1, continued	Approximately 1,970 feet upstream of confluence with St. Johns River	Approximately 2,120 feet upstream of confluence of St. Johns River Tributary No. 3, Branch No. 2	HEC-1	HEC-RAS	2003	AE w/ Floodway	Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration. The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 3, Branch No. 1	Approximately 2,120 feet upstream of confluence of St. Johns River Tributary No. 3, Branch No. 2	Approximately 2,420 feet upstream of confluence of St. Johns River Tributary No. 3, Branch No. 2	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
St. Johns River Tributary No. 3, Branch No. 2	Confluence with St. Johns River Tributary No. 3, Branch No. 1	Approximately 1,830 feet upstream of confluence with St. Johns River Tributary No. 3, Branch No. 1	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 3, Branch No. 2, continued	Confluence with St. Johns River Tributary No. 3, Branch No. 1	Approximately 1,830 feet upstream of confluence with St. Johns River Tributary No. 3, Branch No. 1	HEC-1	HEC-RAS	2003	AE w/ Floodway	The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.
St. Johns River Tributary No. 3, Branch No. 2	Approximately 1,830 feet upstream of confluence with St. Johns River Tributary No. 3, Branch No. 1	Approximately 2,570 feet upstream of confluence with St. Johns River Tributary No. 3, Branch No. 1	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 4	Confluence with St. Johns River	Approximately 2,680 feet upstream of confluence with St. Johns River	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
St. Johns River Tributary No. 4	Approximately 2,680 feet upstream of confluence with St. Johns River	Approximately 3,246 feet upstream of State Road 13N	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 4, continued	Approximately 2,680 feet upstream of confluence with St. Johns River	Approximately 3,246 feet upstream of State Road 13N	HEC-1	HEC-RAS	2003	AE w/ Floodway	The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.
St. Johns River Tributary No. 4	Approximately 3,246 feet upstream of State Road 13N	Approximately 3,846 feet upstream of State Road 13N	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 5	Confluence with St. Johns River	Approximately 1,600 feet upstream of State Road 13N	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
St. Johns River Tributary No. 5	Approximately 1,600 feet upstream of State Road 13N	Approximately 3,710 feet upstream of State Road 13N	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Johns River Tributary No. 5, continued	Approximately 1,600 feet upstream of State Road 13N	Approximately 3,710 feet upstream of State Road 13N	HEC-1	HEC-RAS	2003	AE w/ Floodway	The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). The mean annual flood (2.33-year return period) elevation of the receiving water body was used as the starting water-surface elevations for all four flooding events.
St. Johns River Tributary No. 5	Approximately 3,710 feet upstream of State Road 13N	Approximately 3,916 feet upstream of State Road 13N	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Stevens Branch	At unnamed road	Approximately 2.9 miles upstream of unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Stevens Branch Tributary 1	Confluence with Stevens Branch	Approximately 1.8 miles upstream of confluence with Stevens Branch	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Stokes Creek	Confluence with Tolomato River Tributary No. 1	Approximately 1.9 miles upstream of confluence with Tolomato River Tributary No. 1	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Swamp	At Tall Timber Path	Approximately 4,360 feet upstream of Bluewater Drive	*	*	*	AE	*
TM Pond 7	Palm Valley Road	20 Mile Road	*	*	*	AE	*
TM Pond 14	Palm Valley Road	20 Mile Road	*	*	*	AE	*
TM Pond 15	Palm Valley Road	20 Mile Road	*	*	*	AE	*
TM Pond 41	Palm Valley Road	20 Mile Road	*	*	*	AE	*
Tm Pond 42	Palm Valley Road	20 Mile Road	*	*	*	AE	*

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Tocoi Creek	Confluence with St. Johns River	Approximately 5,660 feet upstream of County Road 13	ADCIRC+ SWAN	JPM-OS	2015	AE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area. The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Tolomato River	Confluence with Matanzas River	County boundary	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	Offshore starting wave conditions are required for 1-D transect-based wave hazard analyses. As part of the JPM-OS ADCIRC+SWAN regional hydrodynamic and wave modeling significant wave heights and peak wave periods were produced at each node contained in the ADCIRC mesh. These results provided valuable information on the wave conditions that can be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Results from the ADCIRC+SWAN modeling were used to develop starting wave conditions for the coastal hazard analyses within the study area.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Tolomato River, continued	Confluence with Matanzas River	County boundary	ADCIRC+ SWAN	JPM-OS	2015	AE, VE	The Joint Probability Method with Optimal Sampling (JPM-OS) was applied to computer Stillwater Elevations (SWELs).
Tolomato River Tributary No. 1	At mouth	Approximately 50 feet upstream of Lakeshore Drive	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Tolomato River Tributary No. 1	Approximately 50 feet upstream of Lakeshore Drive	At US Route 1	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Tolomato River Tributary No. 2	Confluence with Tolomato River Tributary No. 1	Approximately 63 feet upstream of US Route 1	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Town Branch	Confluence with Turnbull Creek	At County Road 208	Regional Regression Equation	HEC-2	*	AE	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Town Branch	At County Road 208	Approximately 4.2 miles upstream of County Road 208	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.
Tributary to Unnamed Drain No. 1	Confluence with Unnamed Drain No. 1	Approximately 1.1 miles upstream of confluence with Unnamed Drain No. 1	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Tributary to Unnamed Drain No. 1, continued	Confluence with Unnamed Drain No. 1	Approximately 1.1 miles upstream of confluence with Unnamed Drain No. 1	ICPR	ICPR	2015	AE	Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Tributary to Unnamed Drain No. 3	Confluence with Unnamed Drain No. 3	Approximately 2.040 feet upstream of confluence with Unnamed Drain No. 3	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Trout Creek	Confluence with St. Johns River	Approximately 1.8 miles upstream of County Highway 16A	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Trout Creek	Approximately 1.8 miles upstream of County Highway 16A	At County Highway 210	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983).

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Trout Creek, continued	Approximately 1.8 miles upstream of County Highway 16A	At County Highway 210	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976).
Turnbull Creek	Approximately 2,900 feet upstream of Pacetti Road	Approximately 80 feet upstream of Interstate 95	HEC-1	HEC-RAS	2003	AE w/ Floodway	The USACE HEC-1 computer program (USACE, 1979; USACE, 1984, Technical Paper No. 95; and USACE, 1991) was used to estimate the discharge-frequency relationships. This methodology was appropriate for the characteristic drainage basin conditions. Furthermore, the limited history of stream gage records precluded effective statistical analysis. The HEC-1 modeling incorporated the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model included subbasin runoff curve numbers, lag times, stream cross sections, and Manning's "n" roughness factors. Lag times were calculated using the empirical NRCS curve number formula developed for natural watersheds (Bedient and Huber, 1988). Channel roughness factors (Manning's "n") were chosen by engineering judgement shaped by field observation, aerial photographs, surveyor photographs of the streams and floodplains, and published text and photographs with recommended roughness values (USGS, 1989 and Chow, 1959). Lack of sufficient stream gage data precluded effective calibration.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Turnbull Creek, continued	Approximately 2,900 feet upstream of Pacetti Road	Approximately 80 feet upstream of Interstate 95	HEC-1	HEC-RAS	2003	AE w/ Floodway	The HEC-1 models were used to estimate peak discharges for the 10-, 50-, 100-, and 500-year floods throughout the study reach. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (U.S. Department of Commerce, 1963). Total depths for the 10-, 50-, 100-, and 500-year storms were 7.5, 10.0, 11.0, and 13.5 inches respectively. The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Florida Department of Transportation, 1987). Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS water-surface profile computer program (USACE, 1997). Input parameters for this program include discharge, downstream (starting) water-surface elevations, channel cross sections, and roughness factors (Manning's "n"). Starting water-surface elevations were applied with flooding governed by larger downstream water bodies where disparity in drainage basin areas between tributary and receiving water body preclude the use of the coincident peak method.
Turnbull Creek	Approximately 80 feet upstream of Interstate 95	Approximately 1,250 feet upstream of Outlet Mall Boulevard	*	*	*	A	The 100-year floodplain boundaries were delineated using a combination of the following: field inspection, engineering judgment, normal depth calculations, topographic maps, previously printed FISs, historic data, examination of available topographic mapping, and water-surface elevations determined by the slop conveyance method.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Ditch No. 1	At Interstate 95	Approximately 1.1 miles upstream of Interstate 95	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Unnamed Ditch No. 2	At unnamed road	Approximately 3,240 feet upstream of unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Ditch No. 3	At unnamed road	Approximately 1.9 miles upstream of unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Unnamed Drain No. 1	At unnamed road	Approximately 1.2 miles upstream of unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Drain No. 2	At unnamed wetland	Approximately 2,600 feet upstream of unnamed wetland	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Unnamed Drain No. 3	At County Road 13	Approximately 1.8 miles upstream of County Road 13	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Drain No. 4	At unnamed road	Approximately 2,430 feet upstream of unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Unnamed Drain No. 5	At Old Brick Road	Approximately 1 mile upstream of Old Brick Road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Drain No. 6	At unnamed wetland	Approximately 4,950 feet upstream of unnamed wetland	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Unnamed Drain No. 7	At unnamed road	Approximately 2,140 feet upstream of unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Drain No. 8	At unnamed road	Approximately 2,675 feet upstream of unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
Unnamed Drain No. 9	At unnamed road	Approximately 1.2 miles upstream of unnamed road	ICPR	ICPR	2015	AE	The hydrologic and hydraulic calculations were performed using Interconnected Channel and Pond Routing (ICPR) unsteady flow software, version 3.10, service pack 10. Rainfall depths were assigned to each subwatershed by interpolating depth values for the centroid of each subwatershed from isohyetal maps from various sources (Hershfield, 1961; Rao, 1988). The Florida Modified Type II rainfall distribution was selected to generate synthetic storm hyetographs. Natural Resource conservation Service (NRCS) methodology was used to calculate rainfall runoff in the models. Initial conditions for ponding areas were based on the outfall invert elevation.
UPA 4	20 Mile Road	Wilson Lane	*	*	*	AE	*

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
UPA 5	Palm Valley Road	20 Mile Road	*	*	*	AE	*
UPA 6	Palm Valley Road	20 Mile Road	*	*	*	AE	*
UPA 7	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 8	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 9	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 10	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 11	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 12	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 13	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 14	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 15	20 Mile Road	Wilson Lane	*	*	*	AE	*
UPA 16	20 Mile Road	Wilson Lane	*	*	*	AE	*
Upper Deep Creek	Approximately 3,500 feet downstream of Old Dixie Highway	Approximately 11,200 feet upstream of Old Dixie Highway	*	*	*	AE	*
Upper Smith Creek	At Crosswater Parkway	Approximately 5,000 feet upstream of Preservation Trail	*	*	*	AE	*
West Run Cracker Branch	At mouth	Approximately 70 feet upstream of Federal Point Road	*	*	2015	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that inter-sected the coastal surge.

Table 13: Summary of Hydrologic and Hydraulic Analyses, continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
West Run Cracker Branch	Approximately 70 feet upstream of Federal Point Road	County boundary	Regional Regression Equation	HEC-2	*	AE w/ Floodway	Regional regression equations developed by the USGS in cooperation with the Florida Department of Transportation were used for deriving peak discharge-frequency relationships (USGS, Water Resources Investigations 82-4012, 1982). The hydrologic calculations for the study area are detailed in Tetra Tech's WRE Note 83-5 (Tetra Tech, 1983). Water-surface elevations for floods of the selected recurrence intervals were developed using the USACE HEC-2 water-surface profile computer program (USACE, 1974 and USACE, 1976). Starting water-surface elevations for the HEC-2 calculations were at high tide.
Wetland S15	Bluewater Drive	Crosswater Parkway	*	*	*	AE	*
Wetland T9	Bluewater Drive	Crosswater Parkway	*	*	*	AE	*
Wetland WC 1	Preservation Trail	Majestic Eagle Drive	*	*	*	AE	*

*Data not available

Table 14: Roughness Coefficients

[Not Applicable to this Flood Risk Project]